Reply

I wish to thank Messrs. Bojkov and Lovill for drawing attention to an apparent discrepancy in the stratospheric layer of maximum springtime change of partial ozone pressure in polar latitudes. The 8–18 km layer mentioned by them is presumably based mainly on Northern hemisphere Umkehr observations and is not necessarily representative for a very high southern latitude. The ozone soundings during the 1958 warming period at Halley Bay (75°S) suggest for that layer a base height of 15 km, not 18 km as stated on p. 168 of my paper. As a matter of fact, the argument there regarding the heat source in the upper stratosphere would be strengthened if one were to accept an 8–18 km layer as generally valid for the Antarctic stratosphere.

Bojkov and Lovill are concerned because one sounding in a ten-day period might not be necessarily representative for the average distribution in that period and because soundings during the IGC (1958) spring period were considered an adequate substitute for the same season in 1960. They object to this manipulation on the grounds that, as they show, ten-day averages of total ozone departed from the single-day values and the trends of change were different during spring 1958 and spring 1960.

The comparison of changes in total ozone at Halley Bay with the contributions from deep stratospheric layers (δO_3, see eq. 7 and Table 4) as calculated from vertical velocity, pressure, temperature and the vertical gradient of ozone mixing ratio $\partial r/\partial z$ was actually based on 1960 data except for $\partial r/\partial z$. Therefore, the results and conclusions will be influenced only to the extent to which the values of $\partial r/\partial z$ are affected by the manipulation.

The effect may be assessed by first estimating the probable error of partial pressure p_3 corresponding to the deviations in total ozone. To this end I have applied partial pressure—total ozone regressions derived by Bojkov (1968, p. 16 and Table 4). Beneath are listed the differences of p_3 corresponding to departures of total ozone on the single days from the ten-day averages.

		Oct.			
Layer	Date	1–10	11–20	21–31	Nov. 1–10
Tropopause to 100 mb level	1958	1	2	4	34 μmb
	1960	−2	2	5	−3 μmb
100 mb–25 mb	1958	1	1	3	26 μmb
	1960	−1	1	4	−2 μmb

From Bojkov's paper the relevant standard errors of estimate amount to 12 and 8 μmb, respectively. Thus only the last column in the table would indicate errors of any consequence. The corresponding errors in the mixing ratio r amount to 0.5 and 1.0 μg/g. From the well-known formula relating r and p_3, and since the errors in p_3 change little with height (total pressure), the values for $\partial r/\partial z$ are acceptable within the tolerance of the calculated ozone changes δO_3.

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REFERENCE

Bojkov, R. D., 1968. Computing vertical ozone distribution from its relationship with total ozone amount. National Center for Atmospheric Research and Dept. of Astrogeophysics, University of Colorado, Boulder, Colorado, NCAR 1968-92.